Itho Solar System
CombiSolar 150

Installation and service manual

Pre-heat drain back solar system with unvented hot water solar cylinder for use with combination boilers

SOLAR Key Mark Certificated

Building Regulations Approved Certificate No. ETC16211

Climate for life

Leave this manual with the User for safe keeping

Contents

1 Introduction.....2
2 Technical data 3
3 General information.....6
4 Installation 12
5 Commissioning.....16
6 System operation 18
7 Routine inspection.....20
8 Component replacement.....20
9 Wiring diagram 23
10 Diagnostics and fault codes.....23
11 Checklist for unvented storage 26
12 Parts list.....27
13 Inspection history 28

1 Introduction

The Itho CombiSolar 150 system is a pre-heat drain back solar collector system which includes a floor standing 150 litre unvented cylinder to store water heated by the solar collector. It is recommended that the system is used in conjunction with a Solar compatible combination boiler but other alternatives may be used if deemed suitable. **Refer Fig. 3 and to Section 4.7.1.**

The CombiSolar 150 system includes a 150 litre cylinder, at least one flat plate drain back solar collector (up to a maximum of three), drain back unit and unvented kit. The 150 litre unvented cylinder is supplied with a pump, control box and temperature sensors. The drain back unit is fitted with a heat exchanger and pump. A 3-way diverter valve is also supplied.

The unvented kit **must be** fitted in the mains water supply to the cylinder. The kit includes a cold fill manifold assembly (which includes a pressure relief valve, pressure reducing valve, check valve and filter), expansion vessel, and a tundish. There is a connection on the manifold that may be used as a balanced cold water supply.

Note: In the Northern hemisphere solar collectors should ideally face South. For more information see Section 3.6.

The solar collector is supplied in special packaging to protect it during transit. The four corners are protected with polystyrene caps and the exposed edges are protected with cardboard. The glass front and aluminium back panel are exposed. The packaging is not intended to support the full lift weight of the collector.

When manually carrying the collector, always hold the exposed edges and not the packaging alone. The collector can be lifted both horizontally and vertically. The collector can only be carried using the lifting forks when on the original wooden pallet base.

IMPORTANT

This System has been approved to the Building Regulations for unvented hot water storage systems and the Local Authority must be notified of the intention to install. Therefore the installation must be carried out by a person competent to install unvented hot water systems.

The installation must be carried out in accordance with the following recommendations:-

All current Building Regulations issued by the Department of the Environment, i.e. Approved Document L1

Building Standards (Scotland) (Consolidation) Regulations issued by the Scottish Development Department

UK Water Regulations/Byelaws (Scotland)

Health & Safety Document No. 635 (The Electricity At Work Regulations 1989)

The installation should also be in accordance with the following British Standard Codes of Practice:-

BS 5449 Forced circulation hot water systems
BS 5546 Installation of hot water supplies for domestic purposes
BS 5918 Solar heating systems for domestic hot water
BS 6700 Design, installation, testing and maintenance of services supplying water

Failure to install this appliance correctly could lead to prosecution and will invalidate the guarantee. It is in your own interest and that of safety to ensure that the law is complied with.

Manufacturer's instructions must **NOT** be taken in anyway as over-riding statutory obligations.

This appliance meets the requirements of IP42, i.e. degree of protection against moisture.

Reference should be made to Criteria for gas fired combination boilers used as after heaters in solar thermal systems and BRE Solar heating UK:1981.

Proviso: WRAS Approval - Solar heating system components. Compliance with the relevant requirements of the Water Supply (Water Fittings) Regulations 1999 has been assessed for this product only as a component of a heating system. If it is to be installed as part of a system using solar energy or ground - or air - source heat pumps for pre-heating water which is to be used as domestic hot water, the Water Fittings Regulations place a legal duty on the installer and user to ensure that the installation and operation of the complete system prevents contamination of domestic hot water by Legionella bacteria, which can grow in water stored at temperatures between 20° and 45°C. Where disinfection by heating is relied on to meet this obligation, information on minimum conditions for thermal disinfection of Legionella bacteria can be found on the WRAS website - www.wras.co.uk

The Itho CombiSolar unvented hot water solar cylinder has been specifically designed to prevent the proliferation of legionella bacteria in this hot water system, and disinfection by heating is not relied upon to meet this obligation.

Lightning Protection

Refer to BS6651 for lightning protection, however this does not give specific requirements for solar panels and generally collectors mounted on non-metallic roof structures will not require lightning protection.

Advice should be sought if mounting on metallic roof structures or mounting in situations where the risk of strikes are high.

2 Technical data

2.1 DHW details

Solar cylinder			
Max. hot water working pressure		5.5 bar	
Max. mains inlet pressure (inlet of pressure reducing valve)		12 bar	
Min. mains water pressure		0.1 bar	
Mains inlet connection		15 mm	
DHW outlet connection		15 mm	
3-way diverter valve connections		15 mm	
DHW cylinder capacity		152 L	
Expansion vessel size (pre-charge press.)		12 L at 3.0 bar	
Pressure reducing valve setting		3.0 bar	
Temperature and pressure relief valve		90°C/7 bar	
Pressure relief valve setting		6 bar	
Flow rate	L/min	Max.18.0	Min. 1.0
	gal/min	Max. 4.0	Min. 0.22
Max. outlet water temp. (approx.)		70°C	
Immersion heater boss		1¼"	

Reference to WRC-NSF Test Procedure 1.50.220 using a 30 kW boiler. Time to reheat water store by 50°C - 36 minutes. Reheat time for 70% of store - 30 minutes

Drain back unit (DBU)	
DHW circuit:	
Flow connection	15 mm
Return connection	15 mm
Max. working pressure	8 bar
Collector circuit:	
Flow connection	15 mm
Return connection	15 mm
Max. working pressure	6 bar
Vessel size	10.5 L
Max. filled content	9.8 L
Heat transfer capacity	110 W/K

Note: Copper pipe MUST be used between the cylinder, drain back unit and collector.

2.2 Solar collector details - per panel

Type:			Portrait	Landscape
Dimensions				
Total surface area		m²	2.5	
Aperture area		m²	2.3	
Length x width x thickness		mm	2230 x 1120 x 92	1120 x 2230 x 92
Water content		L	1.16	1.10
Lift weight		kg	44 Gross - 41 Nett	
Profile of collector when fitted using flashing kit protrudes approximately 30 mm to 60 mm above the tiles (depends upon type of tile used)				
Hydraulics				
Maximum pressure		bar	6	
Absorber				
Aluminium cover and copper pipe (Length x width x depth)		mm	2140 x 1030 x 0.5	1030 x 2140 x 0.5
Spectral selective layer				
Absorption coefficient		%	95	
Emission f		%	5	
Glass				
Transparent, hardened - thickness	mm		4	
Collector housing				
Material			Aluminium pressing	
Insulation				
Thickness		mm	50	
Thermal conduction coefficient		W/mk	0.035	
Cover frame				
Material			Aluminium black powder coated	
Temperature sensor				
Type - NTC		Ohm	10 k	
Connections				
Pre-mounted flexible hoses	Return to DBU	mm	15 mm	
	Flow from DBU	mm	15 mm	
Roof slope			20° Min (90° Max)	30° Min (90° Max)
Energy performance (system with 150L tank)			5.8 GJ/yr (1500 kWh/yr) (2 panels)	
Zero loss collector efficiency (No)			80%	
Collector heat loss coefficient (a1)		W/m²k	3.175	
Aperture to gross collector area ratio			0.9	
Collector pressure drop			@80 l/h - 9 kPa	
Max. wind and snow load	Pitched roof		Same as supporting roof structure	
	Flat roof		Wind speed 27 m/s - Snow load 1.9 kN/m²	
Maximum number of collectors		m²	3 x 2.3 m² = 6.9 m²	

2.3 Installation

Solar cylinder min. clearances for servicing	Top	100 mm
	Bottom	325 mm
	Sides	100 mm
	Front	450 mm
DBU min. clearances for servicing	Top	100 mm
	Bottom	10 mm
	Sides	10 mm
	Front	450 mm
Lift weight - cylinder assembly		33 kg
Lift weight - DBU		9 kg
Weight full and operational - cylinder assembly		185 kg
Weight full and operational - DBU		18.8 kg

2.4 General

Solar cylinder dimensions	Height	1330 mm
	Dia.	710 mm
DBU dimensions	Height	572 mm
	Width	430 mm
	Depth	266 mm
Solar cylinder material		Stainless steel
DBU heat exchanger material		Stainless steel
Covers/Insulation material		EPS foam
Solar cylinder insulation thickness		100 mm
Standing energy loss of solar cylinder		0.96 kWh/24hr 0.27 W/litre
Heat coefficient of cylinder insulation		0.032 W/mK
Global warming potential		Zero
Ozone depletion potential		Zero
Insulation blowing agent		Steam (water)

2.5 Electrical

Supply		230/240 V ~ 50 Hz
External fuse		3 A
Power consumption	Max.	197 W
	Min.	5 W
3-way valve	Power consumption	4 W
	Moisture protection	IP44

2.6 Location

The DBU should be positioned as close as possible under the solar collector. The pipework between the collector and DBU can be extended according to the tables in Fig. 7, maintaining a maximum vertical distance of 4 m using compression fittings only. The pipework between the solar cylinder and DBU can be extended to a maximum of 12 m, maintaining a maximum vertical distance of 6 m.
All pipework should be installed using the minimum of bends and restrictions possible and insulated using high temperature lagging for the pipework between the collector and DBU.
All pipework between the solar collectors, drain back unit and cylinder (and all cylinder connections) MUST be copper with compression fittings.

2.7 Electrical connections

Note: This appliance must be earthed. Do not connect any other controls.

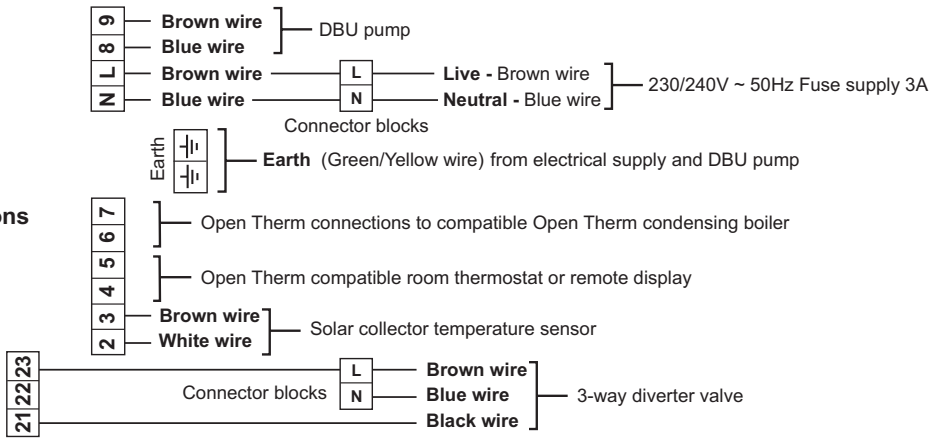
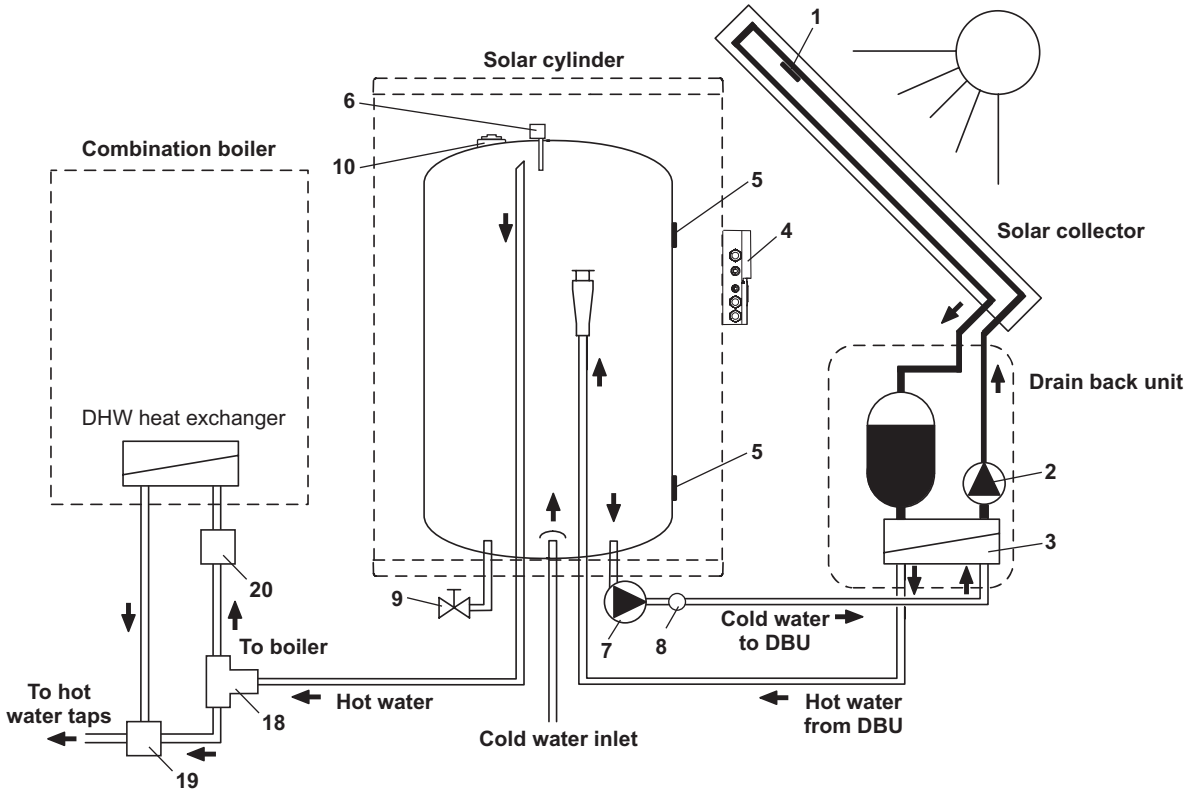
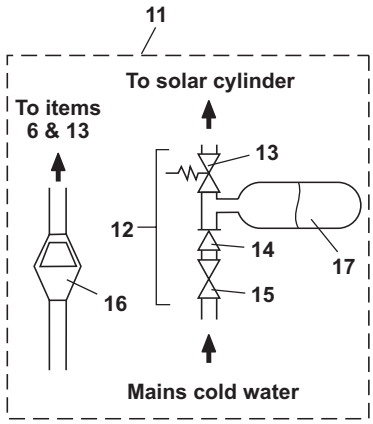


Fig. 1 **Control Box PCB connections**

2.8 CombiSolar schematic





1 Collector temperature sensor
2 Drain back unit pump
3 Drain back unit heat exchanger
4 Control box
5 Temperature sensors
6 Temperature and pressure relief valve
7 Solar cylinder pump
8 Limit thermostat
9 Drain point for cylinder
10 Immersion heater boss
11 Unvented kit
12 Cold fill manifold assembly
13 Pressure relief valve (part of item 12)
14 Non-return valve (part of item 12)
15 Pressure reducing valve with filter (part of item 12)
16 Tundish
17 Expansion vessel
18 3-way diverter valve
19 Thermostatically controlled mixing valve (not supplied)
20 Thermostatically controlled mixing valve (not supplied)
Required when a solar compatible boiler is NOT used

Fig. 2

3 General information

3.1 Electricity supply

The CombiSolar system requires a 230/240 V ~ 50 Hz mains supply, fused at 3 A - **The system must be earthed.**

There must only be one common isolator, providing complete electrical isolation, for the complete CombiSolar system.

This system has been fitted with a supply cable, however, if it is necessary to fit a cable use PVC insulated cable not less than 0.75 mm² (24 x 0.2 mm) to BS 6500 Table 16. The system should be connected to a fused three pin plug and unswitched shuttered socket outlet (both complying with BS 1363), or a fused double pole switch with a contact separation of at least 3 mm in both poles.

Note: There is no electrical connections between the boiler and the CombiSolar system. Therefore, it is recommended that the CombiSolar system electrical isolation is completely separate to the boiler and any external controls isolation.

All wiring must be in accordance with the current IEE Wiring Regulations (BS 7671).

3.2 Domestic hot water system

Ensure the cold mains and hot water pipes do not have any dead legs of pipework.

The mains water supply must be first connected to the cold fill manifold detailed in Section 3.3 before the solar cylinder. No valves must be fitted between the manifold and the cylinder. The incoming mains water pressure to the cylinder is regulated to 3.0 bar by the pressure reducing valve in the manifold. However, all taps and mixing valves used with the hot water system must be suitable for operating at a pressure of up to 8 bar.

Note: The hot water control thermostat on the combination boiler **must always** be set at maximum.

To ensure economic use, the pipe runs to the combination boiler and taps should be in 15 mm copper pipe and be as short as possible. Wherever possible the pipework should be insulated to reduce heat loss.

Thoroughly flush out the mains water supply pipe before connecting it to the boiler and solar cylinder to avoid the danger of dirt or foreign matter entering the system. Ensure the filter in the cold fill valve assembly is clear.

The temperature of the water in the solar cylinder is restricted to a maximum of 70°C. At this temperature the DBU pump is switched off until the cylinder temperature is reduced.

To prevent high temperatures at the hot water taps, it is recommended that a thermostatically controlled mixing valve is fitted after the boiler as shown in Fig. 3.

3.3 Unvented domestic hot water storage system

To comply with the Building Regulations for unvented hot water storage, it is required that the unvented kit detailed in Fig. 3 is fitted before the mains cold water inlet to the solar cylinder. No isolating valves must be fitted between these components and the cylinder.

All these components are supplied with the CombiSolar system in a separate package and must be fitted by a competent person in accordance with the instructions.

The installation is subject to Building Regulations approval and the Local Authority must be notified of the intention to install.

Discharge pipe - The discharge pipes from the temperature/pressure and expansion relief valves must be routed to the tundish supplied and in 15 mm pipe. The discharge pipework from both relief valves may be joined together in the same sized pipe, providing at least 22 mm pipework is connected downstream of the tundish.

Tundish - The tundish must be positioned within 600 mm of the appliance, so that it is visible to the User and away from electrical devices. The minimum size of the discharge pipe downstream of the tundish is given in the following table.

Sizing of copper discharge pipe 'D2' - refer also to Fig. 4A and 4B				
Valve outlet size	Minimum size of discharge pipe 'D1' to tundish	Minimum size of discharge pipe 'D2' from tundish	Maximum resistance allowed, expressed as a length of straight pipe (i.e. no elbows or bends)	Resistance created by each elbow or bend
G½	15 mm	22 mm	up to 9 m	0.8 m
		28 mm	up to 18 m	1.0 m
		35 mm	up to 27 m	1.4 m

The discharge pipework from the tundish:-

1. Shall fall continuously through its length.
2. Shall be of a heat resistant material, e.g. metal.
3. Shall not be fitted with any valves or taps.
4. Shall discharge to a safe visible position, e.g. into a gulley.
5. Shall have a minimum of 300 mm straight pipework directly from the tundish.

Note: Where children may play or otherwise come into contact with discharges, a wire cage or similar guard must be positioned to prevent contact whilst maintaining visibility.

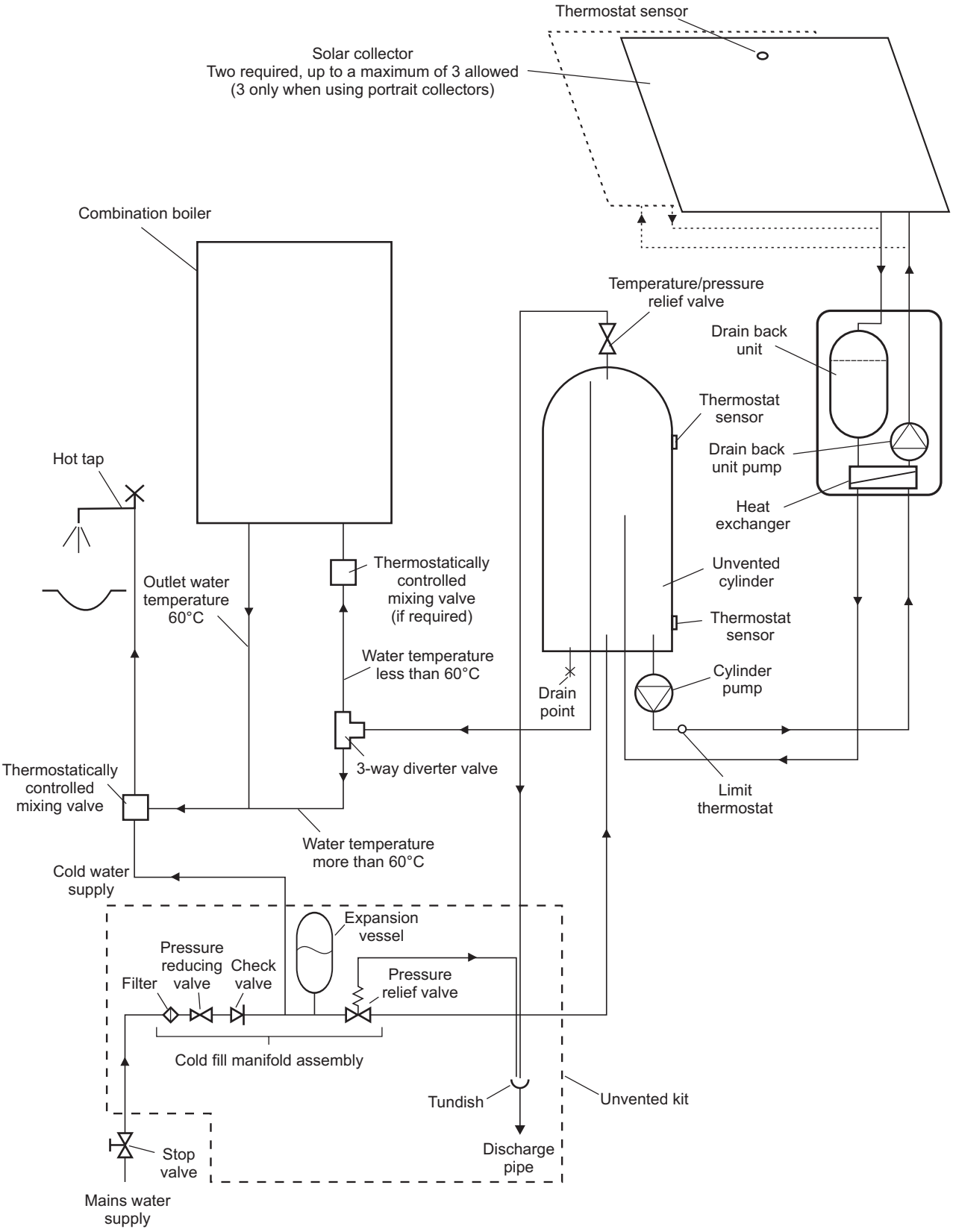


Fig. 3

Note: If the combination boiler is not Solar compatible, a thermostatically controlled mixing valve **MUST BE** fitted in the cold water inlet to the boiler to ensure the water entering the boiler is less than 28°C.

Given below are suggested methods of terminating the discharge pipe safely.

Where a single pipe serves a number of discharges, such as in blocks of flats, the number served should be limited to not more than 6 systems so that any installation can be traced reasonably easily. The single common discharge pipe should be at least one pipe size larger than the largest individual discharge pipe to be connected.

If the system is installed where discharges from safety devices may not be apparent, i.e. in dwellings occupied by blind, infirm or disabled people, consideration should be given to the installation of an electronically operated device to warn when discharge takes place.

a. Low level termination

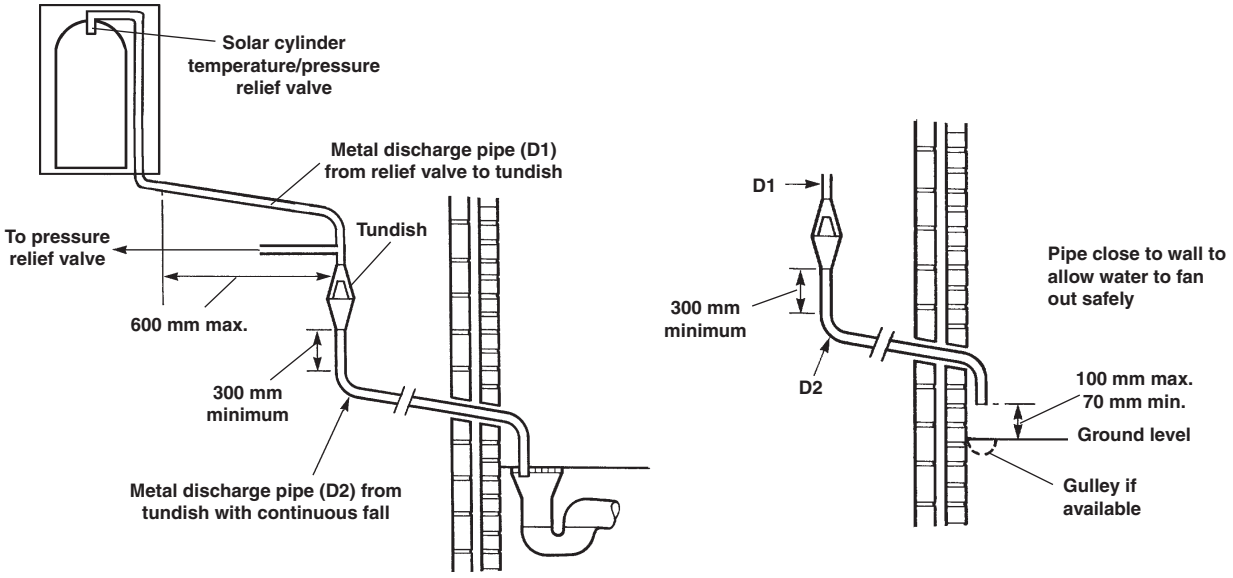

Solar cylinder temperature/pressure relief valve
Metal discharge pipe (D1) from relief valve to tundish
To pressure relief valve
Tundish
600 mm max.
300 mm minimum
Metal discharge pipe (D2) from tundish with continuous fall
D1
300 mm minimum
D2
Pipe close to wall to allow water to fan out safely
100 mm max.
70 mm min.
Ground level
Gulley if available

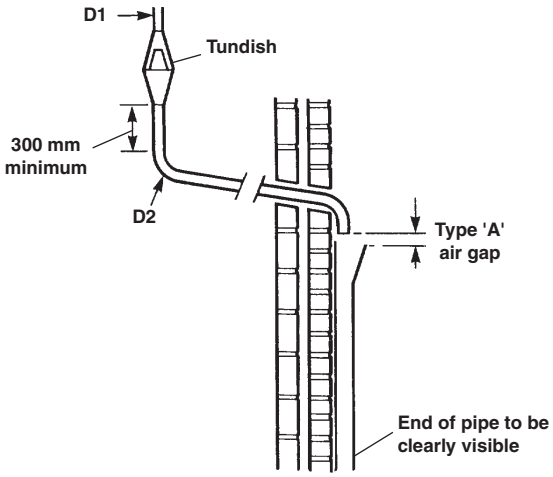
Fig. 4a

b. High level termination

At high level, discharge onto a roof is acceptable providing the roof is capable of withstanding high temperatures and there is a distance of 3 m from any plastic guttering systems that would collect such discharge.

Note: The discharge will consist of scalding water and steam. Asphalt, roofing felt and non-metallic rainwater goods may be damaged by such discharges.

c. Termination into a hopper



Worked example:-

The example below is for a G½ temperature relief valve with a discharge pipe (D2) having four elbows and a length of 7 m from the tundish to the point of discharge.

From the table on page 6:-

Maximum resistance allowed for a straight length of 22 mm copper discharge pipe (D2) from a G½ temperature relief valve is 9 m.

Subtract the resistance for four 22 mm elbows of 0.8 m each = 3.2 m.

Therefore the maximum permitted length equates to 9 - 3.2 = 5.8 m

5.8 m is less than the actual length of 7 m therefore calculate the next largest size.

Maximum resistance allowed for a straight length of 28 mm pipe (D2) from a G½ temperature relief valve equates to 18 m.

Subtract the resistance for four 28 mm elbows at 1.0 m each = 4 m.

Therefore the maximum permitted length equates to 18 - 4 = 14 m

As the actual length is 7 m, a 28 mm (D2) copper pipe will be satisfactory.

Fig. 4b

3.4 Solar cylinder description - Fig. 5

Positioning

The solar cylinder must be installed on a flat horizontal surface which is capable of supporting the weight of the cylinder when full (185 kg).

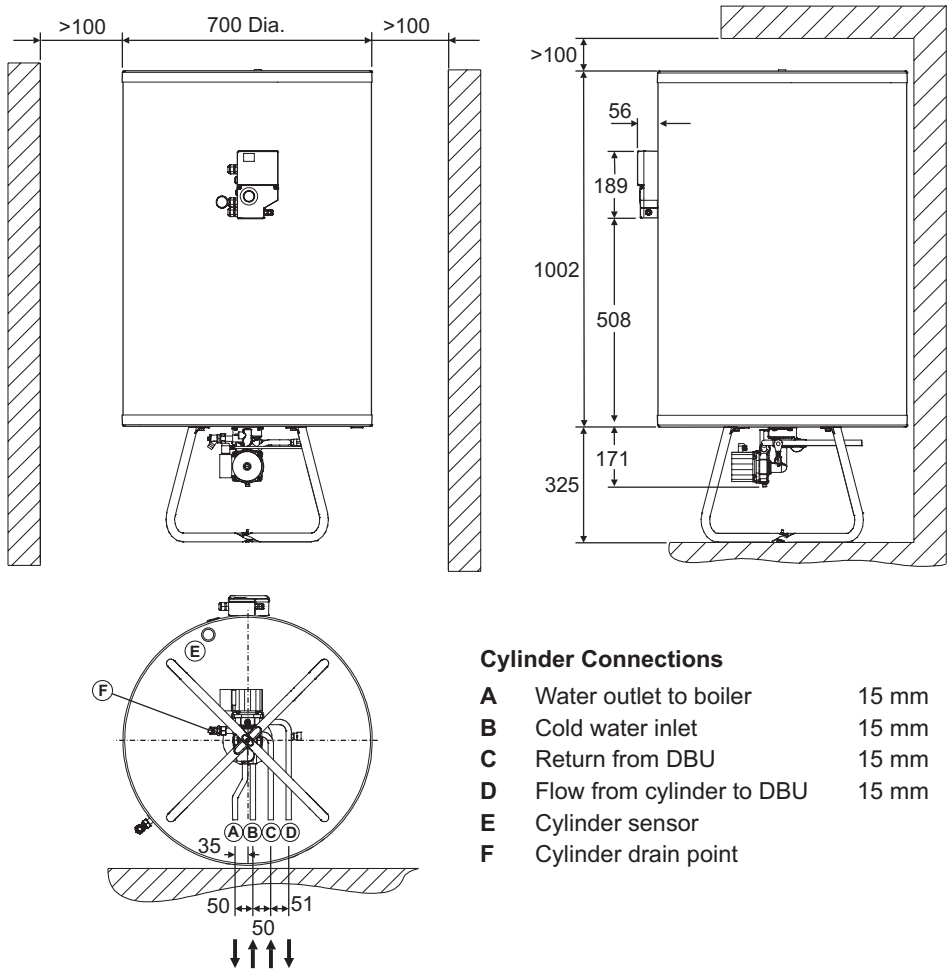
The cylinder may be installed in any room or internal frost free space, although particular attention is drawn to the requirements of the current IEE Wiring (BS7671) Regulations, and in Scotland, the electrical provisions of the Building Regulations applicable in Scotland, with respect to the installation of the cylinder in a room or internal space containing a bath or shower. When the cylinder is installed in a room containing a bath or shower, it must not be possible for a person using the bath or shower to touch any electrical switch or cylinder control utilising mains electricity.

Note: The bottom of the solar cylinder must be located within 6 metres in height from of the top of the drain back unit.

Dimensions

The dimensions of the cylinder and clearances required for servicing are shown in Fig. 5.

Water connections



Cylinder Connections

A	Water outlet to boiler	15 mm
B	Cold water inlet	15 mm
C	Return from DBU	15 mm
D	Flow from cylinder to DBU	15 mm
E	Cylinder sensor	
F	Cylinder drain point	

Fig. 5

The connections at the bottom of the cylinder are shown in Fig. 5.

Note: Use compression fittings only on the cylinder connections and copper pipe between the cylinder and drain back unit. We also recommend a minimum of 1 metre of copper pipe from the cylinder for the water inlet and outlet connections.

3.5 Drain back unit (DBU) description - Fig. 6

Positioning

The DBU must be located within a height of 4 metres of the top of the solar collectors, see Fig. 8. The pipework from the collectors to the DBU **must always** fall by a minimum of 40 mm per metre and **must be** insulated with high temperature pipe insulation.

Note: The DBU must be located within 6 metres in height from of the bottom of the solar cylinder.

Dimensions

The dimensions of the DBU and clearances required for servicing are shown in Fig. 6.

Water connections

All connections on the top of the DBU as shown in Fig. 6.

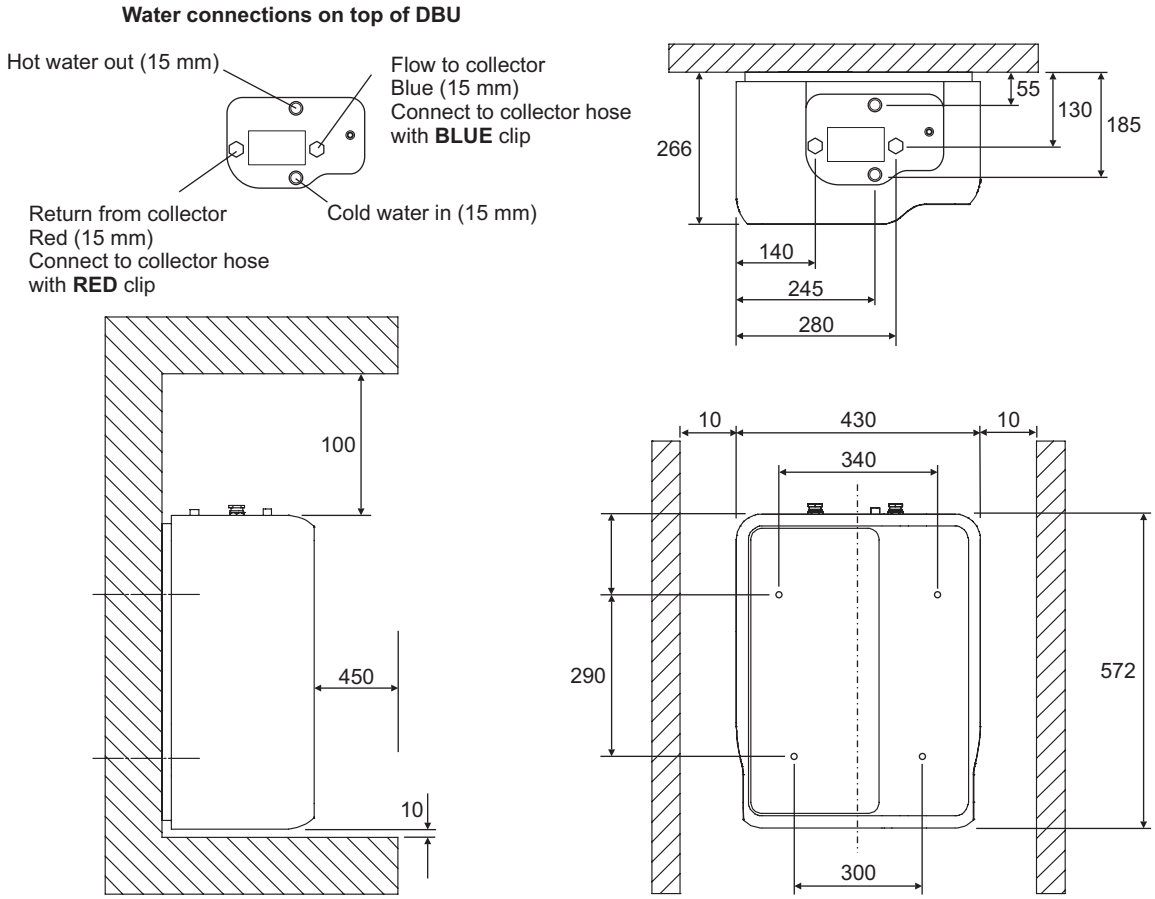


Fig. 6

Note:
1. Use copper pipe and compression fittings only on the pipework between the DBU and solar collectors.
2. The tubing from the solar collectors must always slope down towards the drain back unit (at least 40 mm per metre).
3. There must not be any part of the tubing that will allow water to collect.

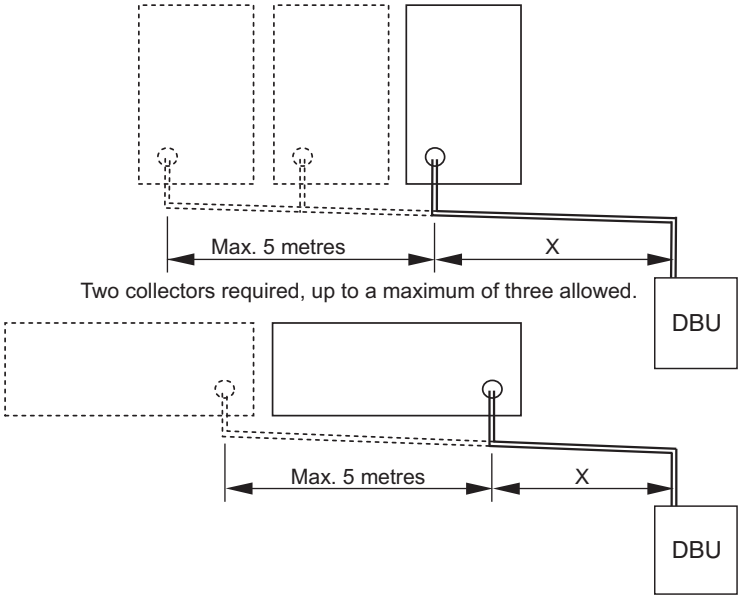
3.6 Solar collector description - Fig. 7

The solar energy supplied by a system varies with the orientation and tilt of the collector, which will usually be determined by the existing roof. However, the predicted variation is slight. For a collector facing anywhere between SE and SW and tilted up to 60° from the horizontal, the annual solar energy supplied will be at least 90% of that obtained at the optimum collector position (South at 30°).

It should be remembered that shading from trees, buildings etc., can produce a significant decrease in system performance, and collectors should be positioned to minimise shading from the sun.

The solar collector can be installed using one of the following methods:

a. **Integration of the collector into the tiles of a pitched roof:** Using the flashing kit (portrait or landscape), landscape or portrait collectors can be integrated into the structure of a pitched roof as shown in Fig. 7. The roof must have an inclination of more than 20° for portrait and 30° for landscape. The tiles used with the flashing kit must be suitable to ensure that the installation is weatherproof. Full details of this type of installation are provided in the instructions supplied with the kit.



Collectors	Portrait inclined roof	Landscape inclined roof	Flat roof
2	X = 10m	X = 10m	X = 10m
3	X = 5m	-	-

Please note: All maximum distances X are under the condition that the connecting pipework between the individual collectors does not exceed the 5 metres !

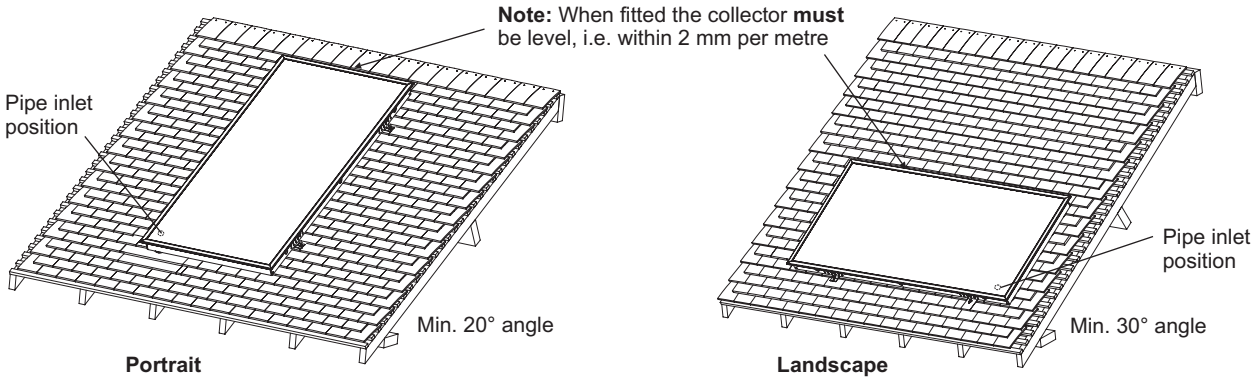

Note: When fitted the collector must be level, i.e. within 2 mm per metre
Pipe inlet position
Min. 20° angle
Portrait
Pipe inlet position
Min. 30° angle
Landscape

Fig. 7

b. Positioning of a landscape collector onto a flat roof: Using the flat roof kit, the collector is mounted on the framework supplied. The collector is fixed at an inclination of 30° and ballast is used to secure the frame in the required position. Refer to Fig. 8 for details of location of the drain back unit in relation to the collector. Full details of this type of installation are provided in the instructions supplied with the kit.

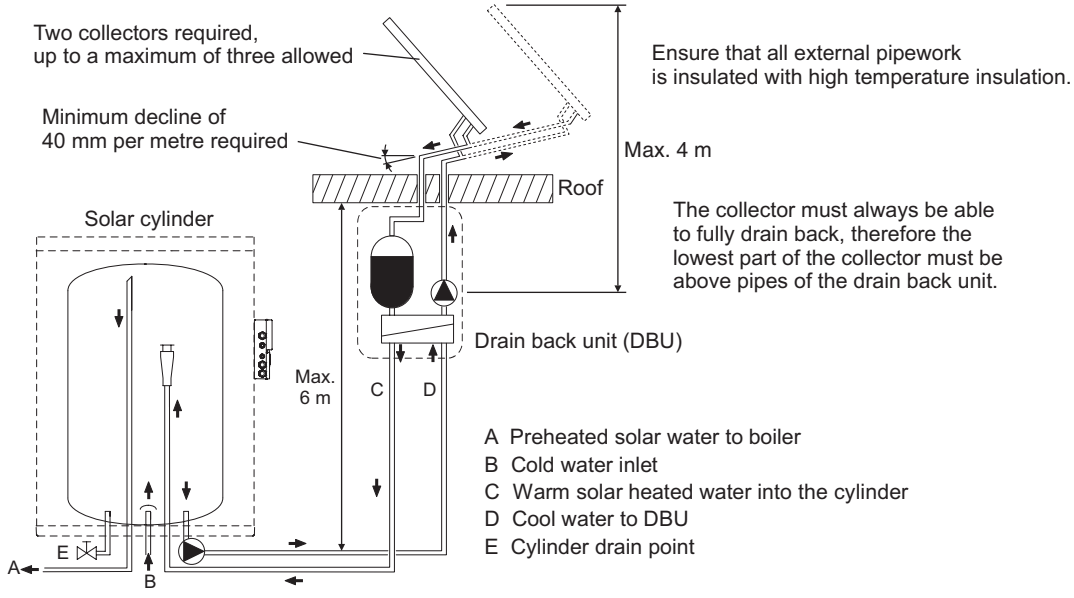

Two collectors required, up to a maximum of three allowed
Minimum decline of 40 mm per metre required
Ensure that all external pipework is insulated with high temperature insulation.
Max. 4 m
Roof
Solar cylinder
The collector must always be able to fully drain back, therefore the lowest part of the collector must be above pipes of the drain back unit.
Drain back unit (DBU)
Max. 6 m
C
D
A Preheated solar water to boiler
B Cold water inlet
C Warm solar heated water into the cylinder
D Cool water to DBU
E Cylinder drain point
E
A
B

Fig. 8

4 Installation

4.1 Unpacking

The CombiSolar 150 system is supplied in three boxes as follows:

Box 1 - Solar cylinder contents include:

Solar cylinder
Inlet pipework assembly
Temperature/pressure relief valve with discharge pipe
Cylinder pump
Cylinder stand
Control box
3-way diverter valve and fittings
Fitting instructions

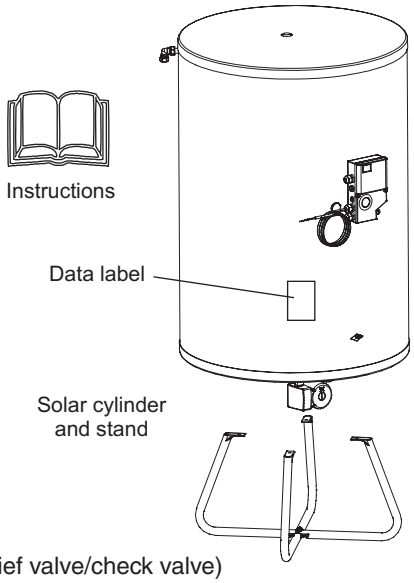


Fig. 9 - Box 1

Box 2 - Drain back unit contents include:

Housing and drain back unit pump
Screw pack
Cable set for collector temperature sensor

Box 3 - Unvented kit contents include:

Cold fill manifold assembly
(includes - 3.0 bar pressure reducing valve/inlet filter and 6 bar pressure relief valve/check valve)
12 litre expansion vessel, pre charged to 3.0 bar
Expansion vessel mounting bracket
Tundish
Fitting instructions

The following items are also required to complete the installation:

1. Solar collectors:

   Portrait ..... Part No. 602-0023
   or Landscape ..... Part No. 602-0024

2. Solar collector mounting kits:

   a. Pitched roof collector flashing kits - portrait 2 to 3 panels, landscape 2 panels.

   Portrait left hand (PL) ..... Part No. 604-0101
   Portrait right hand (PR) ..... Part No. 604-0103
   Portrait middle (PM) ..... Part No. 604-0102
   Landscape left hand (LL) ..... Part No. 604-0105
   Landscape right hand (LR) ..... Part No. 604-0106

   b. Flat roof collector mounting kit, landscape only (2 off) ..... Part No. 604-0110

   c. On-Roof mounting kits for either Portrait or Landscape panels are available as follows:

   On-Roof basic kit ..... Part No. 604-0111
   On-Roof slate kit ..... Part No. 604-0112
   On-Roof tile kit ..... Part No. 604-0113

   The basic kit is always required whether a slate or tile kit is selected.

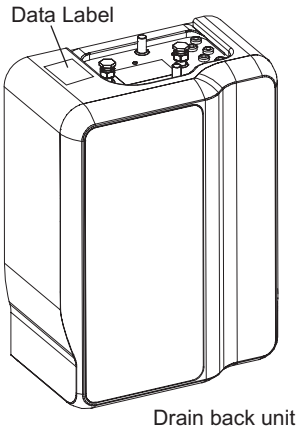


Fig. 10 - Box 2

3. Combination boiler and flue.
   Note: If the boiler is not Solar compatible, a thermostatically controlled mixing valve will be required.
4. Thermostatically controlled mixing valve for hot water outlet.
5. High temperature 15 mm pipe insulation (150°C plus).
6. 15 mm copper pipe and compression fittings with high temperature mounting brackets.

4.2 Location and clearances required

Refer to Section 3.4, 3.5 and 3.6 before locating the solar cylinder, drain back unit and solar collector.

4.3 Fit the collector and mounting structure (flashing kits or flat roof frame)

Refer to installation instructions supplied with the solar collector mounting kit to install the collector.

4.4 Fit the solar cylinder

The cylinder must be installed on a flat surface which is capable of supporting the weight of the full cylinder (see Sections 2.3 and 3.4).

Decide on the position of the cylinder, taking into consideration the clearances and the maximum allowed distances from the drain back unit and collector. Refer to Section 2.6.

4.5 Fit the drain back unit (DBU) - Fig. 11

The DBU may be fitted at an angle of 55 to 90° in relation to the horizontal. If it is fitted vertically only the top two fixings need be used, any other angle and all four fixings must be used. Drilling template, screws and plugs are supplied with the unit. Using the template supplied will ensure the correct positioning of the fixing holes.

1. Decide upon the position of the DBU, taking into account the clearances required around the unit, see Section 3.5, Positioning and Fig. 6.
2. Using the template supplied, mark the position of the fixings, then drill and plug the holes - **ensure they are level**.

   If using only the top fixings, fit two of the screws supplied with the heads about 5 mm proud so that they will locate in the keyhole slots on the fixing bracket.
3. Remove the front cover of the DBU (it is a push fit).
4. Offer the DBU into position and hang it on the two fixing holes.

   If the four fixings are to be used, support the unit while fitting the bottom two screws.
5. The DBU is pre-filled with the exact amount of water required.
6. Connect the pipework from the collector to the DBU connections as detailed in Section 3.5, Fig. 6.

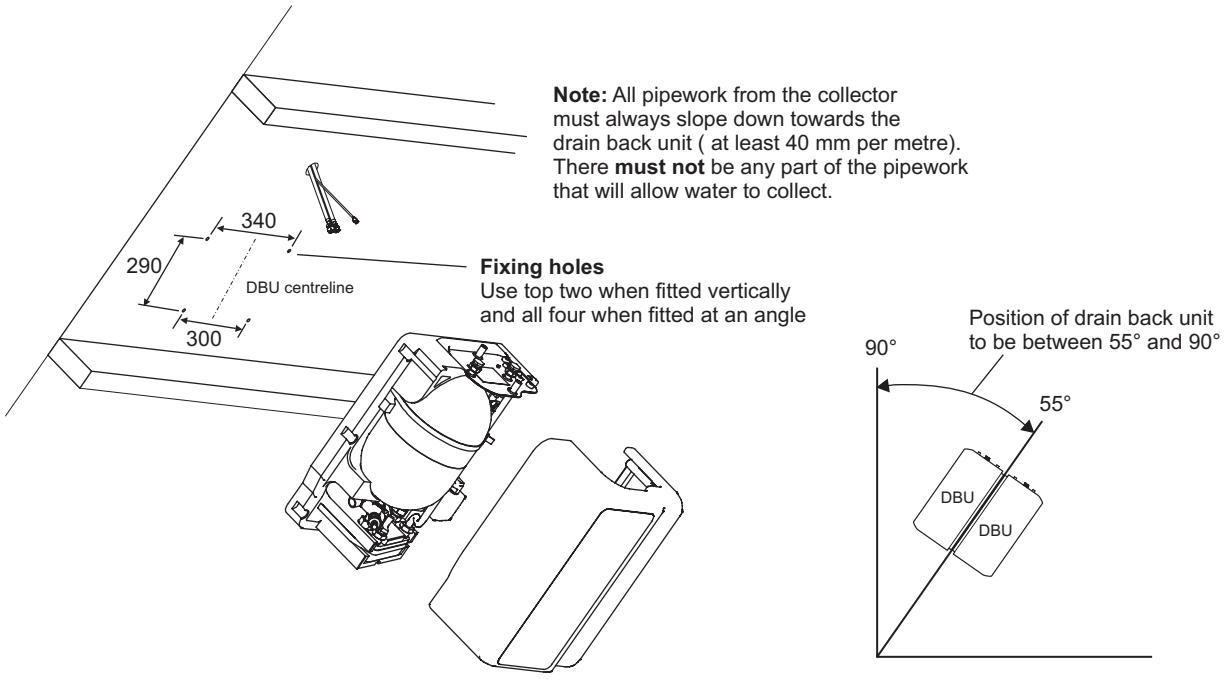

Note: All pipework from the collector must always slope down towards the drain back unit (at least 40 mm per metre). There must not be any part of the pipework that will allow water to collect.
340
290
DBU centreline
300
Fixing holes
Use top two when fitted vertically and all four when fitted at an angle
Position of drain back unit to be between 55° and 90°
90°
55°
DBU
DBU

Fig. 11

4.6 Fit the unvented kit

1. Unpack the box and check the contents.
2. Locate the expansion vessel mounting bracket in a suitable position as close to the cylinder as possible and secure in position with the screws and wall plugs provided. It may be vertical or horizontal.
3. Secure the expansion vessel to the mounting bracket using the metal band, nut, washers and bolt.

   Note: Ensure the pressure in the expansion vessel is 3.0 bar. If it is not, adjust the pressure to give 3.0 bar. Check when the system is not pressurised.
4. Unscrew the plug from the cold fill manifold connection for the expansion vessel (see Fig. 12) and connect it to the expansion vessel using the washer supplied.
   The cold fill manifold can be installed either horizontally or vertically.
   An inverted orientation may allow debris deposits onto the valve seating and cause the valve to malfunction.

   Note: Ensure the arrow marking on the valve body is pointing in the direction of flow.
5. Connect the mains water supply to the manifold inlet and complete the pipework. Thoroughly flush the water pipework. Refer to Domestic hot water system, Sections 3.2 and 3.3.

   Note: No isolation valve must be fitted between the manifold and the solar cylinder.
6. Check the operation of the pressure relief valve (see Fig. 12) by turning the head anti-clockwise until it clicks. The click is the valve lifting off its seat allowing water to escape from the system - check that this is actually happening.

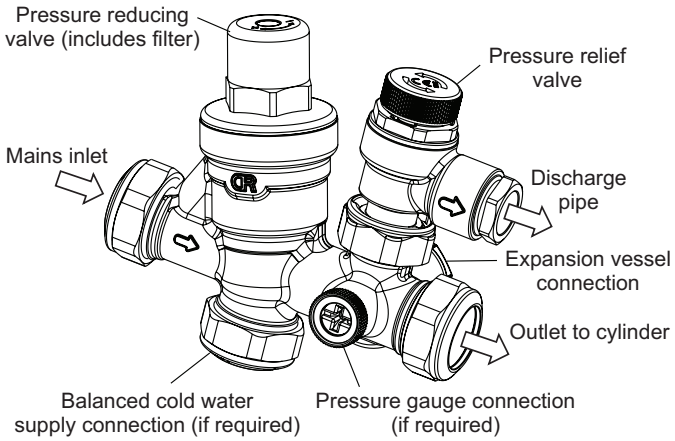


Fig. 12 - Cold fill manifold

4.7 Fit the boiler

1. It is recommended that the system is used in conjunction with a Solar compatible combination boiler. However, if it is not Solar compatible, a thermostatically controlled mixing valve **MUST BE** fitted in the cold water inlet pipework.

   Note: Solar compatible means the boiler is suitable for hot water above 28°C entering the cold water inlet.

   Install the boiler as described in the instruction manual supplied with the boiler.
2. Connect the outlet from the solar cylinder directly to the 3-way diverter valve and then on to the boiler cold water inlet connection. See Figs 2 and 3.

   Note: The diverter valve must be fitted within 1 metre of the cylinder control box.

   It is recommended that a thermostatic mixing valve is fitted in the hot water outlet before the taps.

   Note: Ensure the pipework is connected correctly to the diverter valve. See Fig. 13.
3. The boiler hot water thermostat **must be** set to its maximum position. This will ensure that the hot water temperature from the boiler will be approximately 60°C.

   Note: The User must be informed that the boiler hot water thermostat **must** remain at maximum.

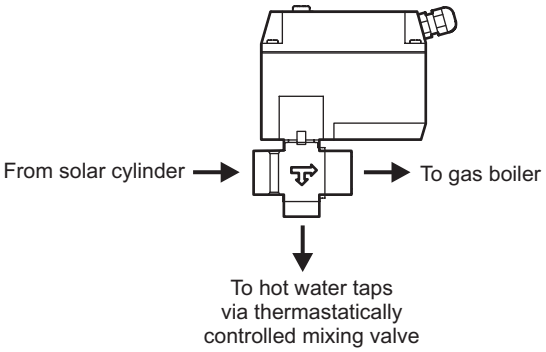


Fig. 13

4.8 Connect the pipework

1. Thoroughly flush out all the water pipework. Ensure that all the caps are removed from the connections.

   Note: If soldering union bends, ensure that the bends are not connected to the valves etc., otherwise the internal seals may be damaged.

   Do not use soldered connections between the solar collector and DBU or at the cylinder connections.
2. Connect the pipework from the unvented kit to the solar cylinder.

   Note: No valves must be fitted between the cylinder and the unvented kit.
3. Connect the system pipework to the boiler and the discharge pipe to the heating system pressure relief valve.

   Do not forget that the pressure relief valve discharge pipe must be routed clear of the boiler to a drain in such a manner that it may be seen, but cannot cause injury to persons or property. Refer to the boiler instruction manual.
4. Connect the discharge pipework to the temperature/pressure relief and expansion relief valves via the tundish supplied.

   This pipework must be installed as recommended in Unvented hot water storage system, Section 3.3.
5. Ensure that all the valves are closed (spindle flats at right angles to valve) and do not turn on the water supply at this stage.

4.9 Electrical connections - See Figs. 14 and refer to Wiring diagram, Section 9

The cylinder sensors (item 1 in Fig. 14b), cylinder pump (iten 2 in Fig. 14b) and the limit thermostat (item 3 in Fig. 14b) are supplied connected to the control box.

1. Remove the screws securing the front of the control box - hinge the bottom cover down and the top cover up to provide access to the terminals on the control board. Refer to Section 2.7 for details of all electrical connections required.
2. **Connect the drain back unit pump(item 7 in Fig. 14b) -** The drain back unit pump is fitted with a cable. Route the cable to the solar cylinder control box. Connect the wires as follows:
   Brown wire to terminal 9, Blue wire to terminal 8 and Green/Yellow wire to ⏚.
   Ensure that the cable is secured in the cable clamp (**7** in Fig 14a).
3. **Connect the collector sensor (item 6 in Fig. 14b) -** The sensor has a 7 metre cable. Plug the white sensor cable into the blue connector sensor cable and route the cable to the solar cylinder control box. Connect the White and Brown wires to terminals 2 and 3.
   Ensure that the cable is secured in the cable clamp (**6** in Fig. 14a).
   Note: When using two or more collectors, only one sensor is connected to the control box - Connect the sensor from the collector in the more shaded position.
4. **Connect the 3-way diverter valve motor (item 4 in Fig. 14b) -** The motor cable is 1.5 metre long. Connect the cable via the cable clamp as follows:
   The Black wire to terminal 21, the Blue wire to the neutral connector block N and the Brown wire to live connector block L.
   Ensure that the cable is secured in the cable clamp (**4** in Fig. 14a).
   Note: Fit a wire to a connector block as follows - Lever up the coloured operating lever until it clicks into the open position, insert the stripped end (9 - 10 mm) of the wire, and return the lever back to its closed position (flush with the connector block housing).
5. **Connect the Mains Supply (item 5 in Fig. 14b) -** Refer to Section 2.7.
   Note: The solar cylinder has been fitted with a mains supply cable. However, if it is necessary to fit an alternative supply cable refer to Section 3.1 and release the cable clamp (**5** in Fig. 14a). Connect the new lead as follows:
   Brown wire to live connector block L, Blue wire to neutral connector block N and Green/Yellow to the earth terminal.
   To fit a wire to a connector block, see paragraph 4 above.
   Note: Ensure that the length of the earth wire is such that if the supply cable is pulled out of its clamp the live and neutral wires become taut before the earth wire.
   DO NOT SWITCH ON the electrical supply at this stage.
6. Make the following connections to the control box PCB, if applicable:
   Connect terminals 4 and 5 to either an Open Therm room thermostat or Remote Display. Connect terminals 6 and 7 to the Open Therm condensing boiler, i.e. if the boiler is suitable for Open Therm connections.

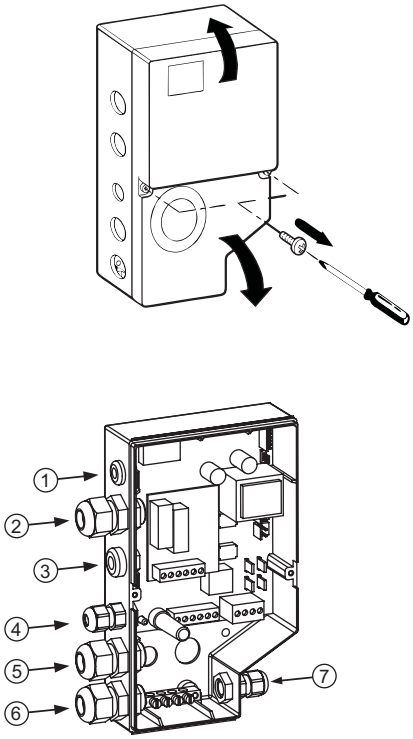
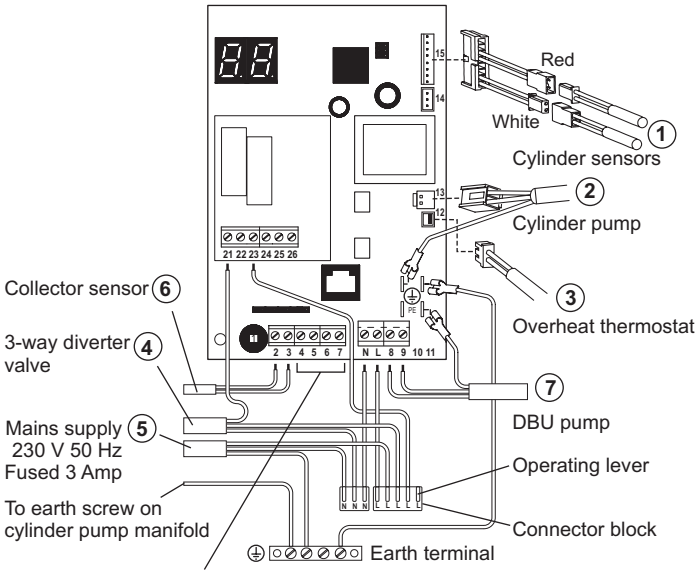


Fig. 14a



Open Therm connections
4 and 5 Open Therm room thermostat or Remote Display
6 and 7 To Open Therm condensing boiler
Note: Do not connect any other external controls

Fig. 14b

5 Commissioning

5.1 Fill the solar cylinder

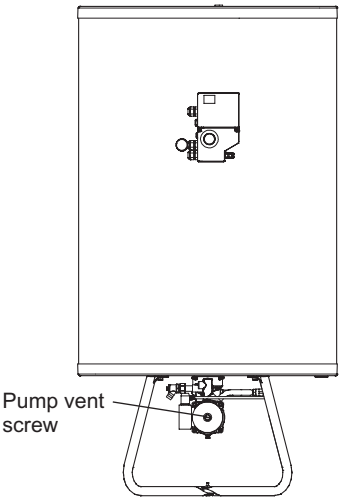


Fig. 15

1. Check that all the mains water connections are tight and any drain valves are closed.
2. Open the mains water inlet valve. Thoroughly flush out the hot water system by turning on all the hot water taps and allow the water to flow until no air is present, this will automatically vent the cylinder of air. Turn off each tap.
3. It is important to vent the solar cylinder pump by unscrewing the centre cap from the pump head (see Fig. 15) until water runs from it and then replace the cap.
4. Isolate the mains inlet and drain the cylinder to remove any debris that may have collected in the cylinder. Refill and vent the system as described above.

5.2 Drain back unit

The drain back unit is supplied pre-filled with the correct quantity of water

5.3 Turn on the electrical supply

1. Check that all the wiring has been correctly installed and that all the terminal connections are tight.
2. Switch on the electrical supply and the display (see Fig. 16) will show 'A1' and start to countdown from eighty to zero. During this countdown the PCB does a self-diagnosis of all the sensors and pumps. If the collector temperature is between 10 and 130°C the drain back unit pump will run for a short period to run a test program, after which the system is ready for use.
3. When all the self-diagnostic procedures have been completed, the display will flash between the solar cylinder temperature and the operation mode.
4. If there is enough solar gain at the collector the cylinder pump and the drain back unit pump will run. The drain back unit pump runs at full speed for 400 seconds to purge any air from the collector(s) then it modulates to its optimum speed for the collector temperature.

5.4 Control box display - Fig. 16

The controls of the solar cylinder are able to indicate working modes in the display. The push button provides the means to operate the cylinder. During normal operation the system can be turned on and off using the button. When the button is held in for 5 seconds the diagnostic mode will be entered. Refer to Section 10.2. If the button is not touched for 10 minutes or is held in for 5 seconds, the last mode will become active.

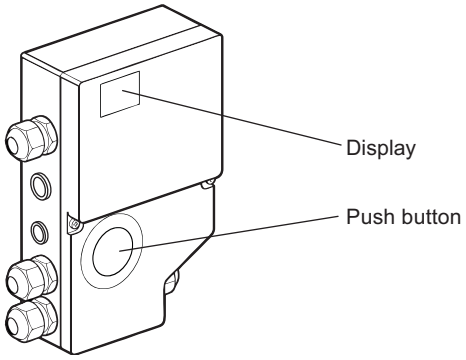


Fig. 16

Display shown	Display explained
	The control of the solar system is operating (standard mode).
	The control of the solar system is not operating. The solar system will not be heating up now. The control can be switched on/off by pressing the button. The control shall then switch from 'oN' to 'oF'. **Note:** Always leave the control at 'oN'.
	System is at rest (no modes such as Pr, Cr, Ar or Sr, yet it is still in the 'oN' mode).
	Pre running Any heat in the drain back unit is removed before the collector mode starts up.
	Collector running The solar cylinder operates and the collector is heated by solar energy.
	After running The drain back unit pump stops, but the system pump will operate to remove the last amount of heat from the drain back unit, transferring it to the solar cylinder.
	Stagnation running When the solar cylinder is not operating the collector temperature can be very high, the system pump will operate to cool down the drain back unit before starting the drain back unit pump.
	Temperature of the domestic hot water in the cylinder During normal operation the display will alternate to show the temperature (°C) of the domestic hot water in the cylinder for 4 seconds, the operating mode (oN/oF) for 2 seconds and the system mode (--, Pr, Cr, Ar, or Sr) also for 2 seconds.
Interruption code with flashing dot in right hand corner of the display	An interruption code (71 to 84) may be displayed together with a flashing dot in the right hand corner of the display. Refer to Section 10.1.

Complete the details of the boiler installation in the Checklist in Section 11.

5.5 User information

The User must be advised (and demonstrated if necessary) of the following important points:-

1. How to turn the CombiSolar system on and off. It is recommended the system is always left on.
2. Explain what information is shown in the display and in the unusual case of a fault occurring, explain the fault codes that may be shown.
3. How important it is for the combination boiler hot water thermostat to be left at the maximum position.
4. Weekly cleaning of shower heads and emptying shower hoses after use.
5. To avoid scalding - if a thermostatic blending valve is not fitted, take due care and attention, especially with children and older people, when running a bath.
6. Ensure the Checklist in Section 11 has been completed after the unit has been installed and commissioned.
7. Leave the instruction manuals with the User for use on future calls and for recording details in the Inspection History Section 13.

6 System operation

6.1 Working principal - Fig. 17

The solar collector uses the energy of the natural light to heat the water being circulated around the collector. When the heated water enters the drain back unit, heat is transfer into the stored water via a plate heat exchanger. Stored domestic hot water is pumped from the bottom of the solar cylinder through the drain back unit plate heat exchanger where it is heated and returned to the cylinder.

When a hot water tap is turned on mains water flows into the bottom of the solar cylinder and hot water flows out of the top towards the diverter valve. If the water from the cylinder is above 60°C the 3-way diverter valve diverts the flow directly to the tap, if the temperature is less than 60°C the valve diverts the flow through the combination boiler. When the flow is via the combination boiler the water temperature is maintained by the boiler. As the temperature of the water entering the boiler is higher than the normal incoming mains water, less gas is required to heat the water to the set temperature of above 60°C thereby saving energy costs.

Note: If the combination boiler is not solar compatible, a thermostatically controlled mixing valve **MUST BE** fitted in the cold water inlet to the boiler.

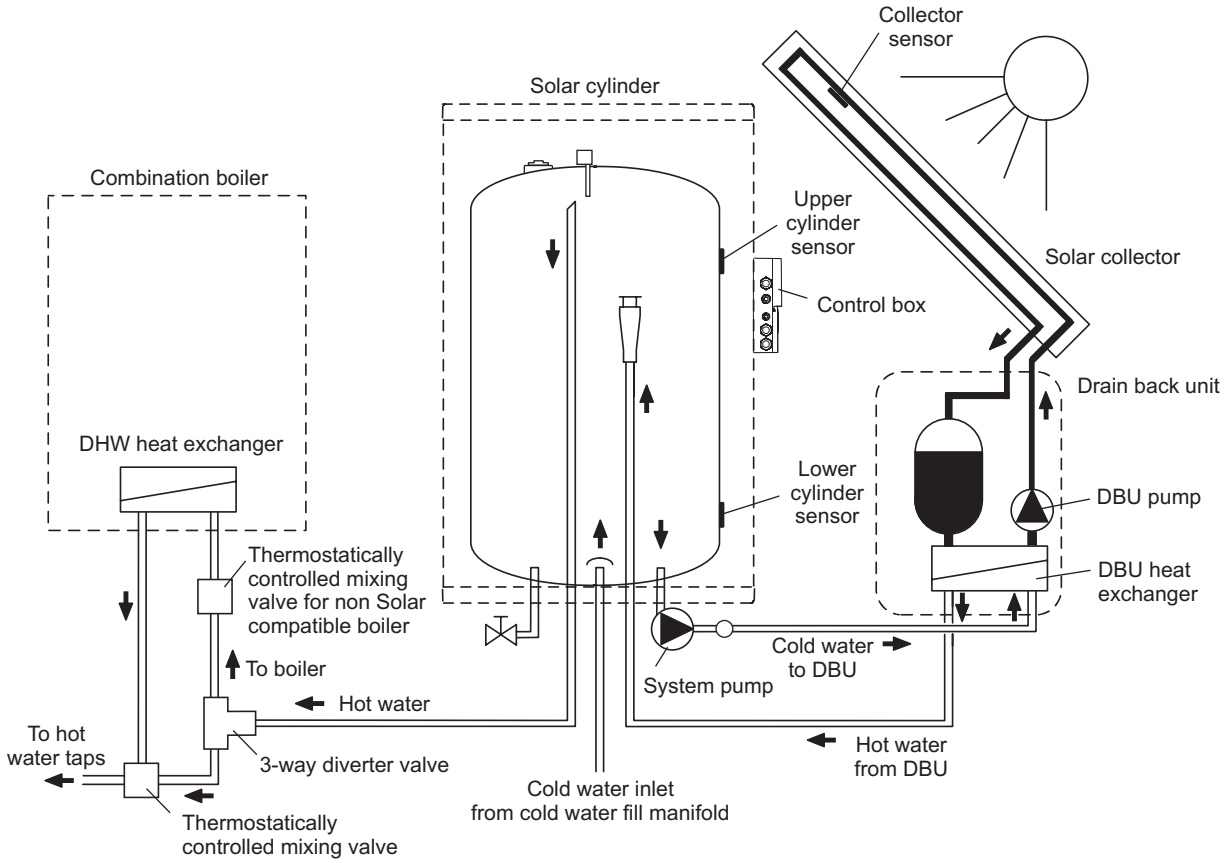


Fig. 17

6.2 Operation of the CombiSolar system - Fig. 17

Control

When the controls detect a collector sensor temperature that is at least 10°C higher than the lower cylinder sensor and the solar cylinder temperature is less than 65°C, the drain back unit pump will start. The pump will run at full speed for 400 seconds and then modulate between 30% and 50% of full speed to circulate water around the collector. The speed of the pump is dependent upon the difference in the temperature between the collector sensor and the lower cylinder sensor.

At the same time that the drain back unit pump starts the cylinder pump will start at 16% of full speed to circulate the cylinder water through the drain back unit heat exchanger. The drain back unit pump will stop when the temperature difference between the collector sensor and the lower cylinder sensor falls to 3.5°C or the cylinder temperature reaches 70°C. The cylinder pump will continue to run for 120 seconds to collect any excess heat from the drain back unit then it will also stop.

If a fault occurs, a fault code will be visible in the display. Refer to Section 10.1 for a list of fault codes and possible solutions.

Temperature display

During normal operation the display (Fig. 16) will alternate to show the temperature (°C) of the domestic hot water in the cylinder for 4 seconds, the operating mode (oN/oF) for 2 seconds and the system mode (--, Pr, Cr, Ar, or Sr) also for 2 seconds, after which the sequence will be continually repeated.

Domestic hot water circuit

When a hot tap is opened, cold mains water enters the solar cylinder at the bottom forcing hot water out from the top to go to the diverter valve. If the water from the cylinder is above 60°C, the 3-way diverter valve diverts the flow directly to the taps. If the temperature is less than 60°C the valve diverts the flow through the combination boiler for further heating and then onto the taps. The cylinder pump passes the cool water from the bottom of the cylinder through the drain back unit heat exchanger and warm water back to the centre of the cylinder.

Collector water circuit

The drain back unit pump (Fig. 17) is controlled by the PCB in the control box. The collector water is circulated in a closed loop through the collector panel(s) where it is heated then passes through the heat exchanger in the drain back unit where heat is transferred to the domestic water from the cylinder.

Frost protection

If the collector sensor registers a temperature less than 3°C, the temperature difference required to start the drain back unit pump (normally 10°C) will be increased by 15° to 25°C. This will ensure that the unit will not operate in frosty conditions (with the possibility of freezing). When the temperature rises above 3°C this temperature difference of 25°C will remain for a further 24 hours when it returns to normal.

Pumps

If the electrical supply is on and the solar system has not operated for 24 hours, the pumps will operate automatically every 24 hours, providing the collector temperature is above 10°C.

Limit thermostat

In the unlikely event the temperature of the stored water in the solar cylinder reaches 90°C, the limit thermostat (see Fig. 3) will operate and switch off the collector pump. If this happens the limit thermostat will need to be manually reset by pushing its reset button.

7 Routine inspection

To ensure efficient operation of the CombiSolar system, it is recommended that it is inspected and checked (by a competent person) as necessary at regular intervals.

Warning: Before removing any covers or working on the system, isolate the electrical supply.

The data label for the cylinder is located on the side of the cylinder housing. The data label for the drain back unit is located on the top of the front cover. Refer to Figs. 9 and 10.

Always carry out electrical system checks, i.e. earth continuity, resistance to earth, short circuit and polarity with a suitable meter, after any electrical work has been carried out on the system.
Check the operation of the system before and after any servicing or replacement of parts.

7.1 Important notes prior to routine inspection

1. Run the system and check the operation.
2. Ensure that all system connections and fittings are sound.
3. Open the solar cylinder drain valve (Fig. 2, item 9) until the water from the bottom of the cylinder runs clear.
4. Inspect and clean, if required, the filter and cartridge in the pressure reducing valve fitted to the cold fill manifold, see Fig. 12 and 18 and Section 8.5.
5. Check the operation of the pressure relief valve by turning the head anti-clockwise until it clicks. The click is the valve lifting off its seat allowing water to escape to the discharge pipe - check that this is happening and that the valve is not leaking after it has been operated,
6. Check the charge in the domestic hot water expansion vessel and re-pressurise, if necessary.
   Note: Only check the expansion vessel charge when the **system** pressure is zero.
7. Record details of the inspection in the Inspection History Section 13.

8 Component replacement

It is recommended that any service work is carried out by a competent person.

Warning: Before removing any covers or working on the system, isolate the electrical supply.

The data label for the cylinder is located on the side of the cylinder housing. The data label for the drain back unit is located on the top of the front cover. Refer to Figs. 9 and 10.

Always carry out electrical system checks, i.e. earth continuity, resistance to earth, short circuit and polarity with a suitable meter, after any electrical work has been carried out on the system.
Check the operation of the system before and after any servicing or replacement of parts.

Refer to Section 12 for information on parts and their location.

8.1 Drain the cylinder

Isolate the mains water supply and open a hot tap to release the pressure in the cylinder. Attach a hose to the drain valve located at the bottom of the cylinder and route the hose to a drain. Open the drain valve to drain the cylinder.

8.2 Expansion vessel

Drain the cylinder as described in Section 8.1. Loosen the vessel clamp and unscrew the vessel from the cold fill manifold assembly while holding the manifold with a spanner to prevent damaging the mains pipe. Reassemble in reverse order with a new vessel and washer.

8.3 Temperature and pressure relief valve

Isolate the electrical supply before removing the casing. Drain the cylinder as described in Section 8.1. Remove the four plastic pins securing the top cover and remove the cover. Remove the insulation around the valve to expose its connections. Undo the 15 mm copper discharge pipe from the valve and undo the valve from the cylinder and remove. Unscrew the adapter from the old valve and fit it to the new one using a suitable joint sealer. Reassemble in reverse order.

8.4 Cylinder manifold assembly

Drain the cylinder as described in Section 8.1. Disconnect the power cable from the pump and the earth lead from the manifold assembly and unplug the limit thermostat. Disconnect all pipe connection and remove the two retaining clips, one either side at the top of the manifold. It is now possible to pull down on the manifold and remove it from the cylinder, taking care not to damage the plastic tubes connected to it.

With the manifold removed from the cylinder it is possible to replace or service the following parts; hot water outlet pipe, mains inlet strainer/diffuser, hot inlet pipe, hot inlet diffuser and pump outlet pipe.
Re-assemble in reverse order.

8.5 Pressure reducing valve and cartridge filter

Drain the cylinder as described in Section 8.1. Unscrew the adjusting screw to decompress the spring and carefully remove the plastic cover using a suitable spanner. Extract the cartridge using long nosed pliers to grip the head of the set screw then withdraw the filter. Clean the filter and cartridge under clean running water.

If the filter or cartridge are damaged replace them.

Re-assemble in reverse order. Refill and check for leaks.

If it is necessary to recalibrate the pressure reducing valve use a suitable Allen key to turn the adjusting screw in the centre of the plastic cover. Rotate it anti-clockwise to reduce the pressure.

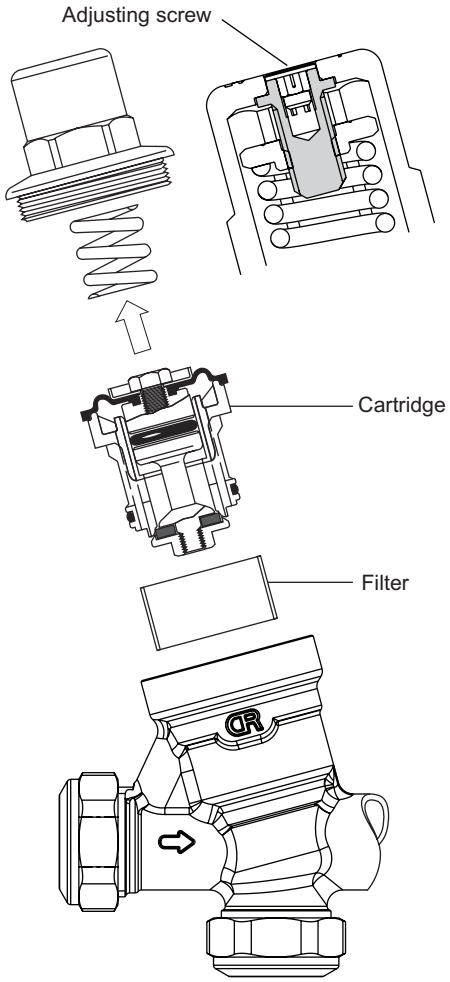


Fig. 18

8.6 Cold fill manifold assembly

The manifold assembly includes the pressure reducing valve and the pressure relief valve.

Drain the cylinder as described in Section 8.1. Unscrew the two mains pipe connections and the discharge pipe connection, then unscrew the manifold from the expansion vessel. Fit the new manifold in the reverse order using a new washer. Open a hot tap to vent any air from the cylinder.

Note: The pressure reducing valve on a new manifold is set to 3.0 bar.

8.7 Cylinder pump

Drain the cylinder as described in Section 8.1. Remove the terminal cover on the pump and remove the supply lead from the terminals. Unscrew the two 5 mm bolts and remove the pump head. Fit the new head and reassemble in reverse order.

8.8 Cylinder temperature sensors

Isolate the electrical supply before removing the casing. Remove the four plastic pins securing the top cover and remove the cover. Remove the four plastic pins from the bottom cover to enable the centre cover to be unwrapped from the insulation, the joint where the centre cover overlaps is stuck with double sided tape and will need to be peeled apart.

The sensors are located in two insulated pockets in the side of the insulation behind two polystyrene plugs. Carefully cut the tape securing the plugs and remove them, peel the sensors from the cylinder and feed them out through the bottom cover. Undo the two screws on the control box cover to expose the PCB and unplug the sensor leads from their plugs, loosen the gland nut and remove the wires. Feed the new sensor leads through the gland and plug them into their corresponding coloured sockets and tighten the gland. Feed the sensors up through the bottom casing and fit them to the cylinder with using the tape supplied making sure they are in the correct location. Reassemble in reverse order.

8.9 Control box PCB - refer to Section 9

Remove the screws securing the control cover and open the cover. Remove all terminal connections and remove all plug in connections. Pull back the two clips to the left of the PCB and pull the PCB forwards to remove. Fit the new PCB and reassemble in reverse order.

8.10 Drain back unit pump - Fig. 19

Note: Care must be taken when carrying out repairs to the drain back unit as it reaches very high temperatures and can emit steam from connections when being removed.

Isolate the electrical supply before removing the front cover of the unit (it is a push fit). Place a bucket under the drain point (see Fig. 19) open the valve to drain (the unit contains just under 10 litres).

Disconnect the pump electrical lead and undo the two pump union nuts then withdraw the pump.

Fit a new pump and sealing washers and re-assemble in reverse order.

To fill the drain back unit

1. Unscrew the level point cap from the fitting in the flow pipe above the pump (Fig. 19).
2. Fill using standard domestic water via the level point with a funnel and hose.
3. Carefully fill the drain back unit until water overflows from the fitting in the pipe above the pump. This indicates the correct fill level has been reached.

Note: Do not overfill.

4. Replace the level point cap to the fitting in the pipe above the pump and ensure the area around the pump is dry.

5. Switch on the electrical supply and 'start up' the CombiSolar system as described in Section 5.3.
6. Check for any leaks and replace the front cover.

It is important to prime the drain back unit pump:- unscrew the centre cap and rotate the spindle using a small screwdriver. Replace the cap.

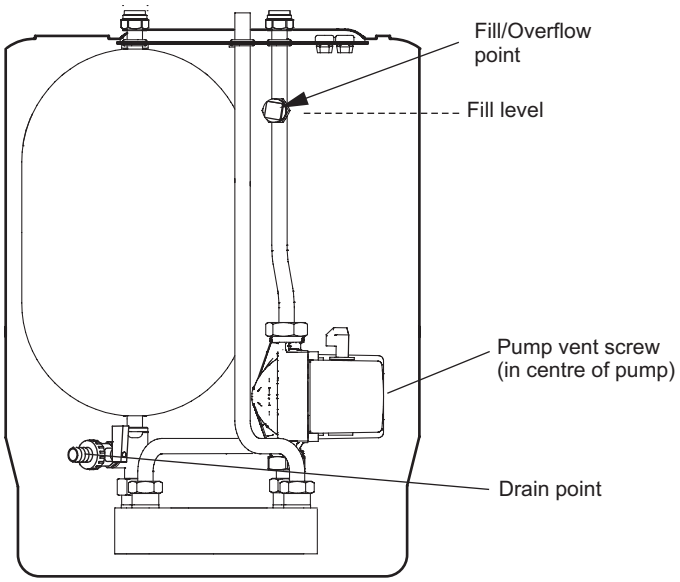


Fig. 19

8.11 Limit thermostat

Isolate the electric supply. The limit thermostat is located on a pipe at the bottom of the cylinder. Pull the plug from the thermostat and unscrew the thermostat from the pipe. Reassemble in reverse order.

8.12 Limit thermostat plug and lead

Isolate the electrical supply. Remove the screws securing the control box cover and remove the cover. Unplug the thermostat lead from terminal 12 on the PCB and the earth lead from its spade connection. Unplug the lead from the thermostat located on the return pipe at the bottom of the cylinder. Loosen the gland securing the lead and remove the lead, then feed the new lead into the gland and reassemble in reverse order.

8.13 Collector temperature sensor

The collector sensor is sealed into the collector during manufacture. If it fails, a replacement sensor kit is available which comprises of a sensor with a lead and grommet attached and a clip for securing the sensor to the collector plate. The collector will have a pre-drilled hole on one side blanked by a rubber grommet, which, must be removed to fit the new sensor. The sensor should be fitted to the clip and then inserted through the hole in the collector with the sensor at the back of the plate and the clip hooked over the front, similar to a pen clipped in a pocket. Slide the grommet along the lead and into the hole making a seal.
Route the lead neatly to the break through in the roof and plug it into its connecting lead.

Note: 1. If a landscape collector is used the position of the grommet will be located at the top left hand side and for portrait collectors the grommet will be located at the top right hand side.
2. Access to the grommet **may** be possible from within the roof area by removing tiles from inside.

8.14 Drain back unit heat exchanger

Note: Care must be taken when carrying out repairs to the drain back unit as it reaches very high temperatures and can emit steam from connections when being removed.

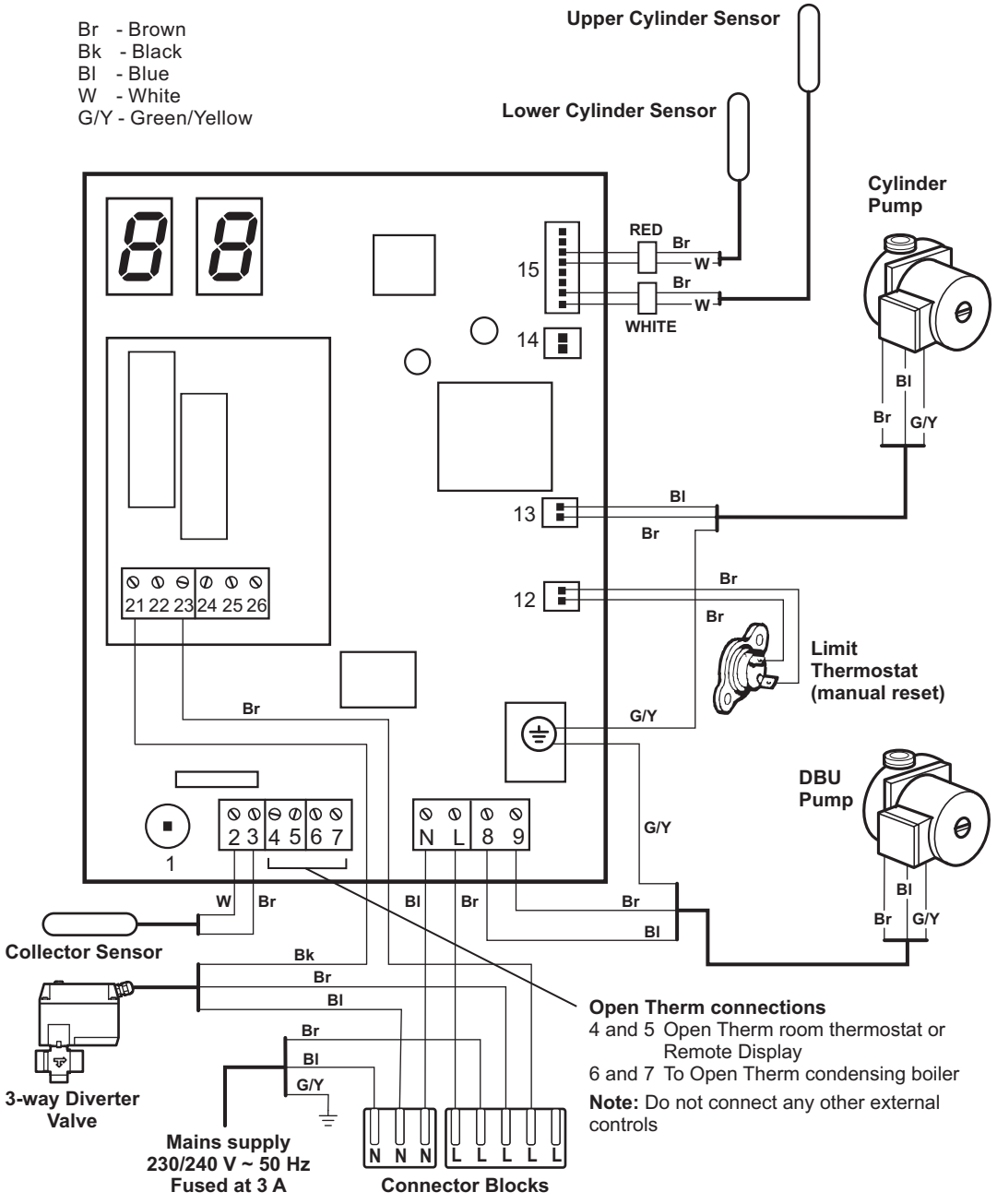
Isolate the electrical supply before removing the front cover of the unit (it is only a push fit). Place a bucket under the drain point (see Fig. 18) open the valve to drain (the unit contains just under 10 litres).

Drain the water from the cylinder as described in Section 8.1. Undo the four pipe connections on the heat exchanger and remove the heat exchanger (it may be necessary to cut the plastic retaining strap). Reassemble in reverse order using new sealing washers and refill the drain back unit (refer to Section 8.10). Close cylinder drain valve and refill cylinder and check for water tightness.

8.15 3-way diverter valve motor

Isolate the electrical supply. Remove the screws securing the control box cover and remove the cover. Disconnect the diverter valve motor cable connections and remove the cable. Remove the motor from the diverter valve body.
Fit the new motor and reassemble in reverse order ensuring all electrical connections are made correctly. Refer to wiring diagram in Section 9.

9 Wiring diagram



10 Diagnostics and fault codes

10.1 Fault codes

The solar system is fully controlled by the electronic control on the cylinder. Fault codes (71 to 84) will be shown in the display (Fig. 15) together with a flashing dot in the right hand corner of the display. The following codes can be displayed.

Codes 71, 72 and 80 will stop the solar system working: The cause must be rectified before the system will operate. When the cause has been rectified the system will start by itself.

Code 71	Temperature of the collector is below -40°C or above 250°C.
Collector sensor fault	Check the collector sensor: does it operate (check sensor resistance in table on next page).
	Sensor cable damaged or short circuited.
	Sensor is faulty.
Code 72	Temperature of the cylinder is below 0°C or above 100°C.
Upper cylinder sensor fault	Check the upper cylinder sensor: does it operate (check sensor resistance in table on next page).
	Sensor cable damaged or short circuited.
	Sensor is faulty.
Code 80	Temperature of the cylinder is below 0°C or above 100°C.
Lower cylinder sensor fault	Check the lower cylinder sensor: does it operate (check sensor resistance in Section 10.3).
	Sensor cable damaged or short circuited.
	Sensor is faulty.

Code 77 is the only code displayed that is not actually a fault: The code will disappear if the button is pressed.

Code 77	The control has not been operating for 30 days.
The system is not turned on	Check the collector sensor and the lower cylinder sensor, do they operate (check sensor resistance in Section 10.3).

Codes 74 and 75 will lock the solar system: The cause must be rectified before the system will operate. When the cause has been rectified the system control can be reset by pressing the button.

Code 74	Check water level in drain back unit.
No circulation in the collector	Check limit thermostat - manually reset if required.
	Check the difference in height between the drain back unit pump and the upper most side of the collector. This can be a maximum of 3 metres.
	Check that the pipework between the DBU and collector is no more than 2 m in length.
	Check the collector sensor and the lower cylinder sensor, do they operate (check sensor resistance in Section 10.3).
	Check the collector tubes, are they blocked with dirt? Is the decline of the pipes within the 40 mm per metre requirement.
	Check the electrical connection and operation of the drain back unit pump and the cylinder pump.
Code 75	After 5 minutes the collector temperature is still too high (above 130°C) with the drain back unit pump operating.
Collector temperature too high	Check the level of water in the drain back unit. Refer to filling procedure in Section 8.10.
	Check the difference in height between the drain back unit pump and the upper most side of the collector. This can be a maximum of 3 metres.
	Check the collector sensor and the lower cylinder sensor, do they operate (check sensor resistance in Section 10.3).
	Check the collector tubes, are they blocked with dirt? Is the decline of the pipes within the 40 mm per metre requirement.
	Check the electrical connection and operation of the drain back unit pump and the cylinder pump.

Codes 82, 83 and 84: These are communication faults between Open Therm compatible boiler and room thermostat.

Code 82	Check the electrical connections between the solar control and the boiler.
No communication with Open Therm boiler	Check the boiler is operating correctly.
Code 83	Check the electrical connections between the solar control and the boiler, and between the boiler and room thermostat.
No communication with Open Therm room thermostat	Check the room thermostat is operating correctly.
Code 84	Check the electrical connections between the solar control and the boiler, and between the boiler and room thermostat.
No communication with Open Therm boiler and room thermostat	Check the boiler and room thermostat are operating correctly.

10.2 Diagnostic menu

To enter the diagnostic menu press the button (beneath the display) in for 5 seconds. Each following press of the button will advance through the diagnostic sequence as shown in the following table.

The code for the item being diagnosed and its value will be alternately displayed.

When you reach the last item, pressing the button again will return you to the first item. If you press the button in for 5 seconds or do not touch it for 10 minutes, the system will leave the diagnostic mode return to the normal operating display.

Item being diagnosed	Display	Value of item being diagnosed
Software version	S0	00 - 99
Frost protection	D0	Cb (Collector protection), 00 means collector protection is in off mode
Mode	D1	oF or oN
Collector temperature	D2	00 - 99 (°C). Above 99°C the value will flash, i.e. flashing 05 indicates 105°C
Upper cylinder temperature	D3	00 - 99 (°C)
Lower cylinder temperature	D4	00 - 99 (°C)
Aux heat source temperature	D5	-- or 00 - 99 (°C)
Drain back unit pump speed	D6	00 - 99 (%)
Cylinder pump speed	D7	00 - 99 (%)
Diverter valve	D8	-- or 0 = not fitted, 1 = Solar collector, 2 = Aux heat source
Fault history	E0 - E9	XX XX = Fault code

10.3 Collector sensor - Temperature and resistance data

°C	KΩ (Ohm)
0	32.15
5	26.31
10	19.86
15	15.89
20	12.49
25	10.00
30	8.06

°C	KΩ (Ohm)
35	6.53
40	5.33
45	4.37
50	3.60
55	2.99
60	2.49
65	2.09

°C	KΩ (Ohm)
70	1.75
75	1.48
80	1.26
85	1.07
90	0.92
95	0.79
100	0.68

11 Checklist for unvented storage

Ensure the following is completed after the unit has been installed and commissioned:-

UNVENTED HOT WATER STORAGE SYSTEM

Are combined temperature/pressure relief valve and expansion valve fitted and discharge tested?	☐ Yes	☐ No
What is incoming static cold water pressure at the inlet to the pressure reducing valve?		☐ bar
Has strainer (if fitted) been cleaned of installation debris?	☐ Yes	☐ No
What is the pressure reducing valve setting (if fitted)?		☐ bar
Where is the pressure reducing valve situated?.....		
Has the expansion vessel or internal air space been checked?	☐ Yes	☐ No

FOR ALL INSTALLATIONS CONFIRM THE FOLLOWING:

The hot water system complies with current Building Regulations	☐ Yes
The appliance and associated equipment has been installed and commissioned in accordance with the manufacturer's instructions	☐ Yes
The operation of the appliance and system controls have been demonstrated to the customer	☐ Yes
The manufacturer's literature has been left with the customer	☐ Yes

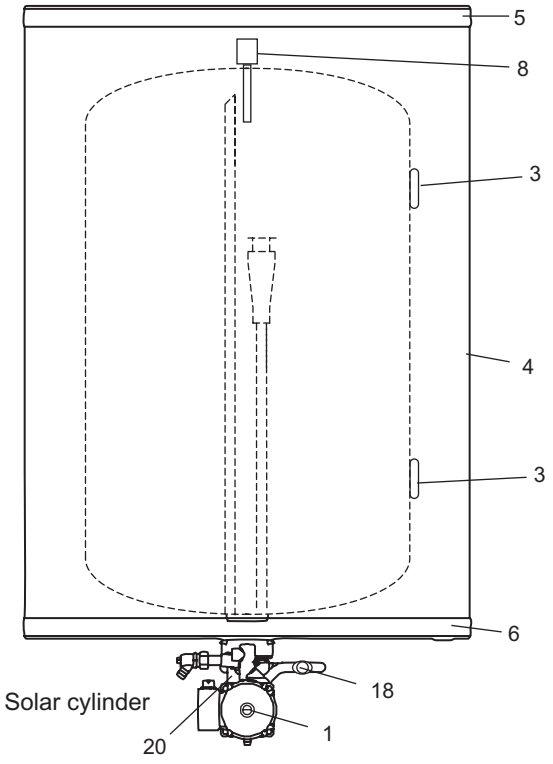
COMMISSIONING ENGINEER'S NAME:

Print .....

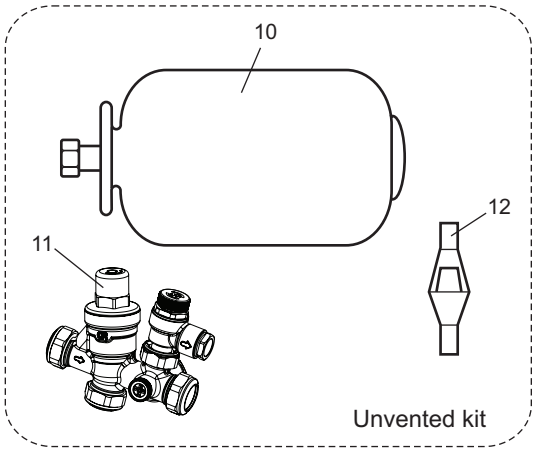
Sign.....

Date .....

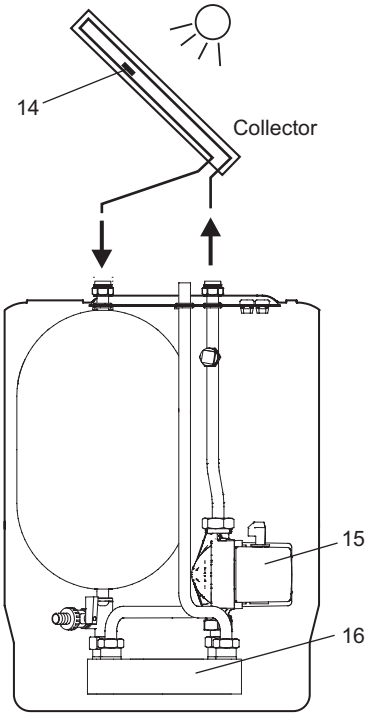
12 Parts list



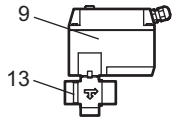
Solar cylinder



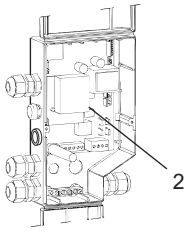
Unvented kit



Drain back unit



3-way diverter valve



Control box

Ref.	Description	Qty.	Part No.	Ref.	Description	Qty.	Part No.
1	Cylinder pump	1	106-0499	-	Collector temperature sensor lead	1	106-1228
2	PCB	1	106-1237	-	Plug and lead - overheat thermostat	1	106-1229
3	Set of 2 cylinder temp. sensors & plug	1	106-0497	-	Collector hoses & fittings - DBU to collector	2	106-0801
4	Housing - cylinder	1	106-0737	-	HT pipe insulation pack - DBU to collector	1	106-0799
5	Top cover - cylinder	1	106-0736	-	Clips - cylinder to manifold	10	106-0668
6	Bottom cover - cylinder	1	106-0738	-	Foam seal - hose entry	1	106-0800
7	Manifold seal kit	1	106-0495	-	Screw pack - DBU	1	106-0812
8	Temp./press. relief valve - 90°C/7 bar	1	106-1221	-	Screw pack - flashing kit	1	106-0796
9	3-way diverter valve motor	1	106-1235	-	Bolt/washer pack - collector to flashing kit	1	106-0797
10	Expansion vessel - 12 litre	1	106-1245	-	12 m collector temp sensor/pump ext. lead kit	1	106-0491
11	Cold fill manifold assembly	1	106-1223	-	Drain back unit pump lead	1	106-1230
12	Tundish	1	106-1224	-	Floor standing frame assembly	1	106-0966
13	3-way diverter valve - body only	1	106-1234	-	Immersion boss plug and seal	1	106-0882
14	Collector temperature sensor kit	1	106-0719	-	Pressure reducing valve cartridge and filter	1	106-1231
15	Drain back unit pump	1	106-0985				
16	Drain back unit heat exchanger	1	106-1199				
17	Drain back unit front cover	1	106-1225				
18	Limit thermostat	1	106-1226				
19	3-way diverter valve 15mm fittings kit	1	106-1236				
20	Manifold and pipework assembly	1	106-1227				

Note: Item 11 - Cold fill manifold assembly, includes a pressure reducing valve (3.0 bar) and a pressure relief valve (6 bar)

13 Inspection history

Details of CombiSolar installation

It is recommended your CombiSolar system is inspected regularly and that you complete the inspection record below.
Note: Always use the manufacturer's specified spare parts when replacing any parts.

Date of Installation:.....

Name of Installer: .....

Address:.....

.....

.....

Postcode:.....

Telephone No:.....

Cylinder Serial Number: ..... DBU Serial Number .....

Details of system inspection history

Date of Inspection	Details of Inspection	Engineer, Company, Tel. No.
.....	.....	.....
	.....	.....
	.....	.....
.....	.....	.....
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This manual has been carefully prepared but we reserve the right to alter the specification at any time in the interest of product improvement. © Itho 2011.

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